

Remarks

This Application has been carefully reviewed in light of the Office Action mailed March 15, 2002. Applicant appreciates the Examiner's consideration of the Application. Claims 1-17, 20-24, 26-27, 29, 33, 36-38, 42-43 and 45 have been amended to clarify, more particularly point out, and more distinctly claim inventive concepts previously present in these claims. These amendments are not considered necessary for patentability. Applicant respectfully requests reconsideration and favorable action in this case.

Claims 17- 26, 31-42, and 47 are allowable under 35 U.S.C. § 101

Independent Claims 17 and 33 are amended to recite generating "a global solution to a global optimization problem in accordance with the first optimal value, the second optimal value, the first value, and the second value, the global solution comprising an option for resolving the negotiation." The claims are directed toward statutory subject matter. As stated by the Federal Circuit in *State Street Bank & Trust Co. v. Signature Financial Group Inc.*, 149 F.3d 1368, 47 USPQ2d 1596 (Fed. Cir. 1998) and as explicitly confirmed in the MPEP, "[T]ransformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, because it produces 'a useful, concrete and tangible result' -- a final share price momentarily fixed for recording and reporting purposes and even accepted and relied upon by regulatory authorities and in subsequent trades." *State Street*, 149 F.3d at 1373, 47 USPQ2d at 1601-02; MPEP § 2106. Generalizing "a global solution," as recited by Claims 17 and 33, is at least as patentable subject matter as generating "a final share price momentarily fixed for recording and reporting purposes," as described in *State Street*. Accordingly, Applicant respectfully requests reconsideration and allowance of independent Claims 17 and 33 and all claims that depend on these independent claims.

Claims 1-16, 26, and 42 are allowable under 35 U.S.C. § 112

Claims 1-16, 26, and 42 are amended to correct informalities. Applicant thanks the Examiner for pointing out the informalities. The claims particularly point out and distinctly claim the subject matter which Applicant regards as the invention, and thus are allowable under 35 U.S.C. § 112.

Claims 1-10, 15-26, and 31-42 are allowable under 35 U.S.C. § 102(b)

The Examiner rejects Claims 1-10, 15-26, and 31-42 under 35 U.S.C. § 102(b) as being unpatentable over U.S. Patent No. 5,495,412 to Thiessen et al. (*Thiessen*). Applicant respectfully submits that *Thiessen* fails to disclose, teach, or suggest the combination of limitations specifically recited in Applicant's claims.

For example, *Thiessen* does not disclose, teach, or suggest:

- (1) determining "a first optimal value according to the first optimization problem;"
- (2) determining "a second optimal value according to the second optimization problem;" and
- (3) generating "a global solution to a global optimization problem in accordance with the first optimal value, the second optimal value, the first value, and the second value" (recited in Applicant's independent Claims 1, 17, and 33).

In contrast, *Thiessen* discloses determining a satisfaction function for each party, combining the satisfaction functions to generate an optimization problem, and then solving the optimization problem. According to *Thiessen*, first, a party's satisfaction associated with alternative solutions to an optimization problem is estimated:

Once these relative additional satisfaction functions are defined, ICANS estimates a party's total additional satisfaction associated with alternatives, i.e., sets of issue decisions. Let V_i^k be a decision taken for a particular alternative k with respect to issue i . The relative total additional satisfaction, S_k , is assumed to be the sum over all issues i of weighted individual relative satisfaction $R_i(V_i^k)$ so that

$$S_k = \sum_i w_i * R_i(V_i^k) \quad (1)$$

Column 8, lines 6-14.

Next, a party's satisfaction associated with a proposed alternative is determined:

Let TS_j be the total additional satisfaction of party j obtained from the proposed alternative having values V_{ij}^* for each issue i . The values of each TS_j , can be calculated from:

$$TS_j = \sum_i^n w_{ij} R_{ij} (V^*_{ij}) \text{ for each party } j \quad (9)$$

Column 10, lines 49-55.

Finally, the satisfaction functions for the parties are combined to form an optimization problem, which is optimized:

To identify a set of solutions on the efficiency frontier that should (if user preference information is still correct) bring greater or at least equal satisfaction to all parties when compared to the common base, ICANS selects those alternatives that maximize the minimum gain in total relative satisfaction, MNGAIN, achieved by all parties, while assuring that a Pareto optimal alternative is generated:

$$\text{maximize } MNGAIN + TGAIN/M \quad (18)$$

subject to:

a) definition of the minimum of the weighted gains:

$$MNGAIN \leq (S_j - TS_j)W_j \text{ for all parties } j \quad (19)$$

b) definition of total net gain of all parties j:

$$TGAIN = \sum_j (S_j - TS_j) \quad (20)$$

together with equations 8 defining the total relative additional satisfaction S_j for each party j.

In equation 19, each TS_j is the known total satisfaction of party j associated with the common base alternative, and the W_j is a positive known weight on the gain of party j. The second term in equation 18, the total net gain divided by a relatively large number M, helps avoid non-dominant solutions in which one or more parties could gain without the possibility of other parties' satisfaction increasing, i.e. MNGAIN would not increase.

Column 12, lines 18-45.

Thiessen discloses determining a satisfaction function for each party, combining the satisfaction functions to generate an optimization problem, and then solving the optimization problem. Consequently, at a minimum, *Thiessen* fails to disclose, teach, or suggest determining "a first optimal value according to the first optimization problem," determining "a second optimal value according to the second optimization problem," and generating "a

global solution to a global optimization problem in accordance with the first optimal value, the second optimal value, the first value, and the second value," as recited in Applicant's claims.

For at least these reasons, *Thiessen* does not disclose, teach, or suggest the combination of limitations specifically recited in Applicant's independent Claims 1, 17, and 33.

Applicant's dependent Claims 2-9, 15-16, 18-26, 31-32, and 34-42 are allowable based on their dependence on the independent claims and further because they recite numerous additional patentable distinctions over the prior art. Because Applicant believes he has amply demonstrated the allowability of the independent claims over the prior art, and to avoid burdening the record, Applicant has not provided detailed remarks concerning these dependent claims. Applicant, however, remains ready to provide such remarks if it becomes appropriate to do so.

Applicant respectfully requests reconsideration and allowance of independent Claims 1, 17, and 33 and all claims that depend on these claims.

Claims 11-14, 27-30, and 43-46 are allowable under 35 U.S.C. § 103(a)

The Examiner rejects Claims 11-14, 27-30, and 43-46 under 35 U.S.C. § 103(a) as being unpatentable over *Thiessen*. For at least the reasons provided above, Applicant respectfully submits that *Thiessen* fails to disclose, teach, or suggest the combination of limitations specifically recited in Applicant's claims.

For at least the reasons provided above, *Thiessen* does not disclose, teach, or suggest the combination of limitations specifically recited in Applicant's independent Claims 1, 17, and 33, whether *Thiessen* is considered alone or in combination with any other prior art of record or with knowledge of one skilled in the art at the time of the invention. Applicant's dependent Claims 11-14, 27-30, and 43-46 are allowable based on their dependence on the independent claims and further because they recite numerous additional patentable distinctions over the prior art. Because Applicant believes he has amply demonstrated the allowability of the independent claims over the prior art, and to avoid burdening the record,

Applicant has not provided detailed remarks concerning these dependent claims. Applicant, however, remains ready to provide such remarks if it becomes appropriate to do so.

Applicant respectfully requests reconsideration and allowance of independent Claims 1, 17, and 33 and all claims that depend on these claims.

Conclusion

Applicant has made an earnest attempt to place this case in condition for allowance. For at least the foregoing reasons, Applicant respectfully requests full allowance of all the pending claims.

If the Examiner believes a telephone conference would advance prosecution of this case in any way, the Examiner is invited to contact Christopher W. Kennerly, the Attorney for Applicant, at the Examiner's convenience at (214) 953-6812.

Although Applicant believes no fees are due, the Commissioner is hereby authorized to charge any fees or credit any overpayments to Deposit Account No. 02-0384 of Baker Botts L.L.P.

Respectfully submitted,

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Mark-Ups Reflecting Changes to Specification

For the convenience of the Examiner, the following mark-ups reflect the changes to the specification.

Please amend the specification as follows:

Please replace the paragraph at page 2, lines 2-16 with:

--In the modern economic environment, [an] a business or other party may engage in a planning activity involving one or more other businesses or parties. For example, an end product manufacturer and a component manufacturer may jointly plan the product manufacturer's procurement of components from the component manufacturer. These two parties may plan, along with a third technology partner, a joint marketing campaign involving all three of these parties. In a competitive business environment involving independent parties, each party naturally seeks to increase the economic value it derives from the planning activity, possibly to the detriment of other parties, subject to certain standard constraints or agreed upon rules. As a result, a party may be unwilling to share with other parties information relating to its internal operations, the values it associates with the planning activity, and any other proprietary information. Furthermore, parties and their pertinent information may change during the course of the negotiation. It is a goal to obtain a sufficiently optimal global solution that balances competing interests of multiple parties to a planning activity while satisfying their particular needs. Previous techniques have been inadequate in this environment.--

Please replace the paragraph at page 3, lines 16-28 with:

--The present invention provides a number of technical advantages over previous techniques. The present invention makes possible multi-party constrained optimization by generating multi-party constrained optimization problems (MOPs) and providing optimal solutions to the MOPs, while allowing the parties to the negotiation to keep their objectives and constraints from one another and, at least in part, from the broker. In addition, the present invention allows handling of stochastic or otherwise dynamic MOPs, in which one or more parties, objectives, or constraints may change during the negotiation. The present invention includes schemes for achieving Pareto-optimal and globally fair solutions, and further allows the

parties to participate in the filtering and selection of global solutions the broker generates, increasing the confidence the parties have in the broker and the operations used. These and other technical advantage make the present invention well suited for modern multi-party planning environments. Other technical advantages are readily apparent to those skilled in the art.--

Please replace the paragraph at page 4, lines 7-8 with:

--FIGURE 4 is an exemplary table illustrating solutions to a multi-party constrained optimization problem; and--

Please replace the paragraph at page 5, lines 2-16 with:

--FIGURE 1 illustrates an exemplary system 10 to solve one or more multi-party constrained optimization problems (MCOPs). System 10 includes multiple parties 12 that are coupled to and communicate information related the MCOPs with broker 14 using associated broker links 16, which may be any appropriate wireline, wireless, or other communications links. Parties 12 may be individuals, business, or any other suitable entities that are each planning an activity that involves one or more other parties 12. Broker 14 is preferably an impartial individual, business, or other entity appropriate to communicate with the parties 12 to facilitate their negotiation of a sufficiently optimal solution to one or more associated MCOPs. Parties 12 may select broker 14 through a preliminary negotiation or in another suitable manner. Parties 12 communicate with one another using one or more party links 18, which may be any suitable wireline, wireless, or other communications links. One or more rules governing the negotiation between parties 12, the authorized activities of broker 14, any commission payable to broker 14, and other suitable considerations may also be decided during a preliminary negotiation among parties 12, with or without interaction with broker 14.--

Mark-Ups Reflecting Changes to Claims

For the convenience of the Examiner, the following mark-ups reflect changes to the claims.

1. (Amended) A [broker] system for multi-party constrained optimization, the [broker] system operable to:

access a first optimization problem and a first value corresponding to a first party to a negotiation, the first optimization problem comprising at least one first objective to which the first value relates;

access a second optimization problem and a second value corresponding to a second party to the negotiation, the second optimization problem comprising at least one second objective to which the second value relates;

determine a first optimal value according to the first optimization problem;

determine a second optimal value according to the second optimization problem; and

generate **a global solution to** a global optimization problem in accordance with the first [and] **optimal value, the** second [optimization problems and] **optimal value,** the first **value,** and **the** second value[s].

2. (Amended) The [broker] system of Claim 1, wherein the first optimization problem is received from the first party and comprises at least a portion of a constrained optimization problem (COP) for the first party, the COP comprising at least the first objective.

3. (Amended) The [broker] system of Claim 2, wherein the COP further comprises at least one constraint relating to one or more global variables.

4. (Amended) The [broker] system of Claim 1, wherein at least the first value is selected from the group consisting of:

a threshold value received from the first party; and

[an] the first optimal value [generated] determined according to the first optimization problem, the first optimization problem being received from the first party.

5. (Amended) The [broker] system of Claim 1, wherein [the broker is operable to generate] the global optimization problem [as] comprises a linear programming (LP) problem.

6. (Amended) The [broker] system of Claim 1, [further operable to generate a global solution to the global optimization problem, the global solution comprising a first solution] wherein the first optimal value for the first objective [which] satisfies the first value, and [a second solution] the second optimal value for the second objective [which] satisfies the second value.

7. (Amended) The [broker] system of Claim [6] 1, further operable to generate the global solution as a Pareto-optimal solution.

8. (Amended) The [broker] system of Claim [7] 1, further operable to generate the global solution as a fair solution according to one or more fairness criteria.

9. (Amended) The [broker] system of Claim 8, wherein the fairness criteria are selected from the group consisting of:

an equal distribution criterion;

a geometric distribution criterion;

a weighted distribution criterion;

a weighted geometric distribution criterion; and

a minimum deviation from optimal criterion.

10. (Amended) The [broker] system of Claim [6] 1, [wherein the broker is] further operable to access an additional first value for the first party, access an additional second value for the second party, and generate an additional global solution satisfying the additional first value and the additional second value[s].

11. (Amended) The [broker] system of Claim [6] 1, further operable to:
communicate one or more global solutions to the first party and the second [parties] party;
receive filtering information from the first party and the second [parties] party;
use the filtering information to determine one or more filtered solutions from among the global solutions according to a filtering approach.

12. (Amended) The [broker] system of Claim 11, wherein the filtering approach is selected from the group consisting of:

- a veto approach;
- a Pareto-optimal ranking approach;
- an optimal weighted preferences approach; and
- a mixed approach combining two or more of the above.

13. (Amended) The [broker] system of Claim [6] 1, further operable to:
communicate one or more solutions to the first party and the second [parties] party;
receive selection information from the first party and the second [parties] party; and
use the selection information to determine a selected solution from among the solutions according to a selection approach.

14. (Amended) The [broker] system of Claim 13, wherein the selection approach is selected from the group consisting of:

- an auction approach; and
- a random selection approach.

15. (Amended) The [broker] system of Claim 1, further operable to mediate at least a portion of a negotiation between the first party and a third party substantially simultaneously with the negotiation between the first party and the second party.

16. (Amended) The [broker] system of Claim 1, wherein the [broker] system comprises a computer system.

17. (Amended) A method for multi-party constrained optimization, comprising:
accessing a first optimization problem and a first value corresponding to a first party to a negotiation, the first optimization problem comprising at least one first objective to which the first value relates;

accessing a second optimization problem and a second value corresponding to a second party to the negotiation, the second optimization problem comprising at least one second objective to which the second value relates;

determining a first optimal value according to the first optimization problem;

determining a second optimal value according to the second optimization problem;

and

generating a global solution to a [at least one] global optimization problem according to the first [and] optimal value, the second [optimization problems and] optimal value, the first value, and the second value[s], the global solution comprising an option for resolving the negotiation.

18. The method of Claim 17, further comprising receiving the first optimization problem from the first party, the first optimization problem comprising at least a portion of a constrained optimization problem (COP) for the first party, the COP comprising at least the first objective.

19. The method of Claim 18, wherein the COP further comprises at least one constraint relating to one or more global variables.

20. **(Amended)** The method of Claim 17, wherein at least the first value is selected from the group consisting of:

a threshold value received from the first party; and

[an] the first optimal value [generated] determined according to the first optimization problem, the first optimization problem being received from the first party.

21. **(Amended)** The method of Claim 17, wherein the global optimization problem **[is generated as] comprises a linear programming (LP) problem.**

22. **(Amended)** The method of Claim 17, **[further comprising generating a global solution to the global optimization problem, the global solution comprising a] wherein the first [solution] optimal value for the first objective [which] satisfies the first value, and [a] the second [solution] optimal value for the second objective [which] satisfies the second value.**

23. **(Amended)** The method of Claim **[22] 17**, wherein the global solution is generated as a Pareto-optimal solution.

24. **(Amended)** The method of Claim **[22] 17**, wherein the global solution is generated as a fair solution according to one or more fairness criteria.

25. The method of Claim 24, wherein the fairness criteria are selected from the group consisting of:

an equal distribution criterion;

a geometric distribution criterion;

a weighted distribution criterion;

a weighted geometric distribution criterion; and

a minimum deviation from optimal criterion.

26. (Amended) The method of Claim [22] 17, further comprising:
accessing an additional first value for the first party;
accessing an additional second value for the second party; and
generating an additional global solution satisfying the additional first value and the additional second value[s].

27. (Amended) The method of Claim [22] 17, further comprising:
communicating one or more global solutions to the first party and the second [parties] party;
receiving filtering information from the first party and the second [parties] party;
using the filtering information to determine one or more filtered solutions from among the global solutions according to a filtering approach.

28. The method of Claim 27, wherein the filtering approach is selected from the group consisting of:
a veto approach;
a Pareto-optimal ranking approach;
an optimal weighted preferences approach; and
a mixed approach combining two or more of the above.

29. (Amended) The method of Claim [22] 17, further comprising:
communicating one or more solutions to the first party and the second [parties] party;
receiving selection information from the first party and the second [parties] party;
use the selection information to determine a selected solution from among the solutions according to a selection approach.

30. The method of Claim 29, wherein the selection approach is selected from the group consisting of:
an auction approach; and
a random selection approach.

31. The method of Claim 17, further comprising mediating at least a portion of a negotiation between the first party and a third party substantially simultaneously with the negotiation between the first party and the second party.

32. The method of Claim 17, wherein the method is implemented on one or more computer systems.

33. **(Amended)** Software for multi-party constrained optimization, the software embodied in a computer-readable medium and operable to:

access a first optimization problem and a first value corresponding to a first party to a negotiation, the first optimization problem comprising at least one first objective to which the first value relates;

access a second optimization problem and a second value corresponding to a second party to the negotiation, the second optimization problem comprising at least one second objective to which the second value relates;

determine a first optimal value according to the first optimization problem;

determine a second optimal value according to the second optimization problem; and

generate **a global solution to** a global optimization problem in accordance with the first **[and] optimal value, the** second **[optimization problems and] optimal value,** the first **value,** and **the** second value[s], **the global solution comprising an option for resolving the negotiation.**

34. The software of Claim 33, wherein the first optimization problem is received from the first party and comprises at least a portion of a constrained optimization problem (COP) for the first party, the COP comprising at least the first objective.

35. The software of Claim 34, wherein the COP further comprises at least one constraint relating to one or more global variables.

36. (Amended) The software of Claim 33, wherein at least the first value is selected from the group consisting of:

a threshold value received from the first party; and

[an] the first optimal value [generated] determined according to the first optimization problem, the first optimization problem being received from the first party.

37. (Amended) The software of Claim 33, wherein [the software is operable to generate] the global optimization problem [as] comprises a linear programming (LP) problem.

38. (Amended) The software of Claim 33, [further operable to generate a global solution to the global optimization problem, the global solution comprising a] wherein the first [solution] optimal value for the first objective [which] satisfies the first value, and [a] the second [solution] optimal value for the second objective [which] satisfies the second value.

39. The software of Claim [38] 33, further operable to generate the global solution as a Pareto-optimal solution.

40. The software of Claim [38] 33, further operable to generate the global solution as a fair solution according to one or more fairness criteria.

41. The software of Claim 40, wherein the fairness criteria are selected from the group consisting of:

an equal distribution criterion;

a geometric distribution criterion;

a weighted distribution criterion;

a weighted geometric distribution criterion; and

a minimum deviation from optimal criterion.

42. (Amended) The software of Claim [38] 33, further operable to access an additional first value from the first party, access an additional second value from the second party, and generate an additional global solution satisfying the additional first value and the additional second value[s].

43. (Amended) The software of Claim [38] 33, further operable to:
communicate one or more global solutions to the first party and the second [parties] party;
receive filtering information from the first party and the second [parties] party;
use the filtering information to determine one or more filtered solutions from among the global solutions according to a filtering approach.

44. The software of Claim 43, wherein the filtering approach is selected from the group consisting of:

- a veto approach;
- a Pareto-optimal ranking approach;
- an optimal weighted preferences approach; and
- a mixed approach combining two or more of the above.

45. (Amended) The software of Claim [38] 33, further operable to:
communicate one or more solutions to the first party and the second [parties] party;
receive selection information from the first party and the second [parties] party;
use the selection information to determine a selected solution from among the solutions according to a selection approach.

46. The software of Claim 45, wherein the selection approach is selected from the group consisting of:

- an auction approach; and
- a random selection approach.

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47. The software of Claim 33, further operable to mediate at least a portion of a negotiation between the first party and a third party substantially simultaneously with the negotiation between the first party and the second party.